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Research Report

An Overview of Road Traffic Injuries Among Children in Malaysia and Its Implication on Road Traffic Injury Prevention Strategy



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Contents

	Page
List of Figures	v
List of Table	vi
List of Plate	vi
Acknowledgements	vii
Key Findings	ix
1. Introduction	1
1.1 Number of Children and Population Pyramid	2
1.2 Vulnerability of Children	3
1.3 The Growing Societal Problem	4
1.4 Consequences of Traffic Injuries on Children	5
2. The Objectives	7
3. Method and Data Source	7
4. Results and Discussion	8
4.1 10-year trend in Fatal Child Traffic Injuries in Malaysia	8
4.2 Proportion of Child Road Traffic Deaths as Compared to All Deaths Due to Road Traffic Injuries	10
4.3 Proportion of Child Road Traffic Injuries by Age Group and Outcomes, 2007–2009	10
4.4 Proportion of Child Traffic Injuries or Casualty by Gender and Age Group	11
4.5 Proportion of Child Road Traffic Death by Type of Road User and Age Group	12
4.6 Proportion of Casualty Due to Road Traffic Injuries Among Children by Type of Road User and Age Group	13

**An Overview of Road Traffic Injuries Among Children in Malaysia
and Its Implication on Road Traffic Injury Prevention Strategy**

4.7	Pedestrian Injuries Among Children in Malaysia	14
4.7.1	Number and proportion of fatal pedestrian injuries by age group	15
4.7.2	Proportion of children pedestrian injuries by type of activity	16
4.7.3	Children's activities and location of crash	17
5.	Implication on Policy and Programmes	18
5.1	Key Findings for Preventive Actions	18
5.2	Key Findings for Future Research	22
	References	24

List of Figures

	Page
Figure 1 Total population of children in Malaysia, 2005–2010 (est.)	2
Figure 2 Population pyramid of Malaysia (2010, est.)	3
Figure 3 Top leading causes of admission to government hospitals in Malaysia due to unintentional injuries (0–19 years old), 2003–2005	5
Figure 4 Fatal and non-fatal injury rates by severity for age group 0–17	6
Figure 5 Number of fatalities by age group of children, 2000–2009	9
Figure 6 Fatality rate per 100,000 populations of age-specific children, 2004–2009	9
Figure 7 Proportion of road traffic death among children, 2007–2009	10
Figure 8 Proportion and number of road traffic injuries by age group and outcomes, 2007–2009	11
Figure 9 Number and proportion of child casualty due to road traffic injuries by gender-age group, 2007–2009	12
Figure 10 Number and proportion of fatal child traffic injuries by road user and age group, 2007–2009	13
Figure 11 Number and proportion of casualty among children due to road traffic crashes, 2007–2009	14
Figure 12 Number and proportion of fatal child pedestrian injuries, 2007–2009	15
Figure 13 Proportion of child pedestrian injuries by type of activity, 2007–2009	16
Figure 14 Proportion of child pedestrian injuries by location of road crash, 2007–2009	17

List of Plate

	Page
Plate 1 Overloading and un-helmeted children being transported by motorcycles	21

List of Table

Table 1 Matrix of effectiveness of each road safety strategy	22
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Key Findings

This report provides an overview of road traffic injuries among children in Malaysia. Based on a nationwide police-based surveillance database, the key findings are as follows;

- Fatal road traffic injuries among children (Age 0–18 years old) account for 13.6 (2007) to 15.5% (2009) of total fatality caused by road traffic injuries in Malaysia.
- The road traffic fatality rate per 100,000 population varies by age group from 3.9 (15–18 years old) to 6.8 (<1 year old) per 100,000 population.
- Children transported in private vehicles (car, van, 4WD) are the first and second leading cause of traffic related-death among children aged 1–4 years old (43.8%) and 5–9 years old (30.2%) respectively.
- 12% of children (1–18 years old) suffering from fatal road traffic are pedestrians.
- Pedestrians are the first and second leading group of child road users who die due to road traffic injuries among children aged 5–9 (43.5%) and 1–4 years (30.2%) respectively.
- Among children aged 1–4 years old, 47.7% of crashes involving pedestrians occur close to their homes in residential areas.
- Road crashes involving pedestrians occur at school areas varies by age groups. The highest is among age group 10–14 years old (18.5%) followed by age group 5–9 years old (16.5%) and 15-18 years (16.1%).

An Overview of Road Traffic Injuries Among Children in Malaysia and Its Implication on Road Traffic Injury Prevention Strategy

- Children motorcycle riders is the top group of traffic related-death among children aged 15–18 years old.
- Children pillion riders are the third leading group of traffic related-deaths among children aged 1–4, 5–9, and 10–14 years old.

1.0 Introduction

Children use roads together with pedestrians, cyclists, motorcyclists, and other vehicle users. They even use the roads as playing fields, especially when they live close to the roads. With a range of risk factors, notably immaturity, risk taking behaviours and small body stature that make their visibility to road users very low, interaction with the roads and other road users will increase the risk susceptibility of children to traffic injury.

The present study applies the definition of child as used by the United Nations Convention on the Right of the Child, Article 1 which states that “a child means every human being below the age of 18 years” (United Nations 1989). However, as the risk, exposure, and injuries are different for different age groups, standard age groupings are needed to obtain an accurate profile of child injury and to recognise the different characteristics of the different age groups. Commonly used age breakdowns are (1) infancy, <1 year; (2) early childhood, 1–4 years of age; (3) childhood, 5–9 years of age; (4) early adolescence, 10–14 years of age; and (5) late adolescence, 15–17 years of age. This grouping corresponds to the major periods of socialisation in childhood and is appropriate because there are different patterns in risk and health hazard exposure, and, consequently, different patterns of injury and disease outcome. Without such a breakdown, it will be difficult to design adequate interventions and, equally important, to monitor and evaluate their effectiveness (Linnan *et. al* 2007).

1.1 Number of Children and Population Pyramid

Since independence in 1957, Malaysia has been experiencing rapid growth in population, economy, industrialisation, and motorisation. The annual population growth rate remained constant at 2.1 to 2.2% over the past decade. The estimated annual population growth for 2010 is 2.1%. Based on the population projection for 2010, children of the age group of 0–19 years constitute 40.8% (11,811,100) of the total population (28,908,800 est.). Figures 1 and 2 show the number of children and distribution of population in Malaysia, which indicate that the highest population group consists of children aged 0–4 years old. This relatively high proportion of children leads to higher risk exposure and more frequent interaction between the road environment and road users.

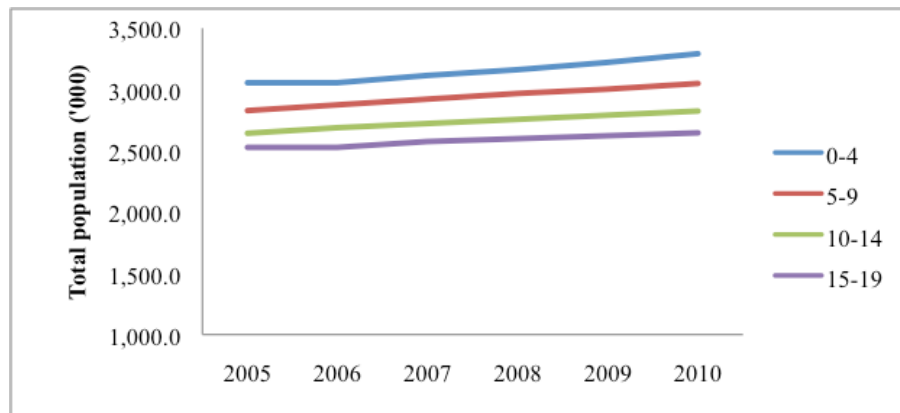


Figure 1 Total population of children in Malaysia, 2005–2010 (est.)

An Overview of Road Traffic Injuries Among Children in Malaysia and Its Implication on Road Traffic Injury Prevention Strategy

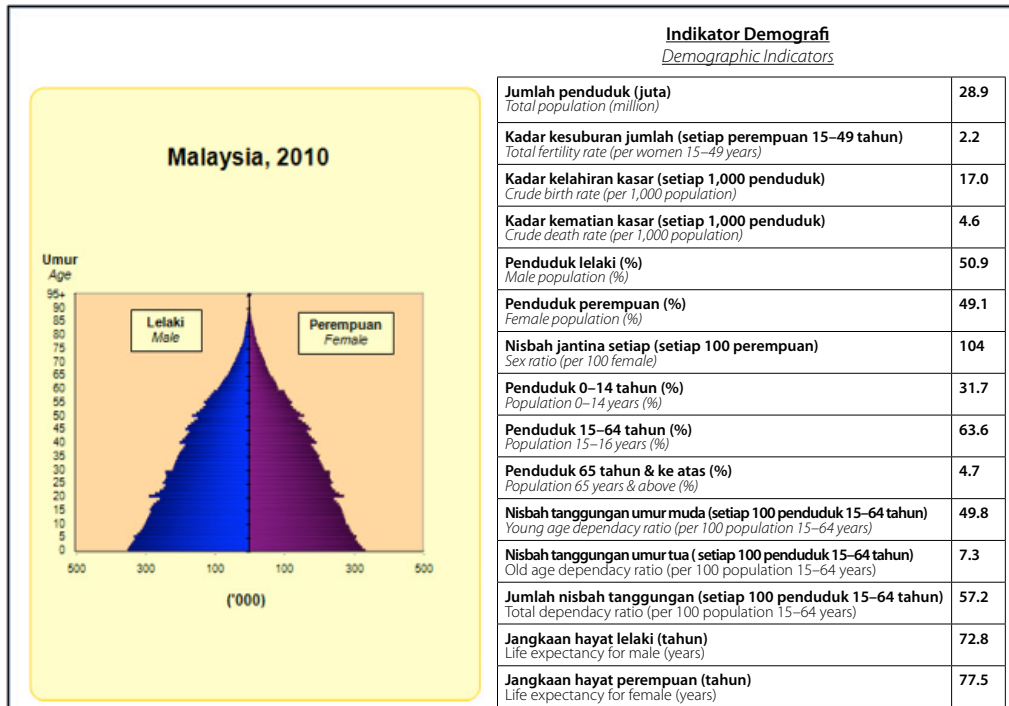


Figure 2 Population pyramid of Malaysia (2010, est.) (Source: <http://202.75.5.100/populationpyramid/>, Department of Statistics, Malaysia)

1.2 Vulnerability of Children

Safety experts consider children as vulnerable road users due to the fact that they are inexperienced, immature and fragile. A child's body parts are all in a state of growth that makes a child physically more vulnerable to any contact as compared to an adult. The small physical stature of children limits their ability to see or to be seen by other road users (Wilson *et. al* 1991 and Toroyan and Peden 2007). Furthermore, the ability of a child to make safe decisions in the road environment is related to the development of cognitive ability that is closely related to age. Children between the age of five and seven years exhibit poor ability in recognising and assessing hazards when crossing a road. In addition, their ability to switch attention from one task to another is also poor, leading to an increased risk of being involved in a crash, as they tend to fail to stop or slow down

An Overview of Road Traffic Injuries Among Children in Malaysia and Its Implication on Road Traffic Injury Prevention Strategy

before attempting to cross the road (Dunbar, Hill and Lewis 2001; Siegler and Richard 1979; Zeedyk, Wallace and Spry 2002).

Another critical cognitive development stage, which is not fully developed until children get to the age of 10–12 years old, is the full integration of visual signals into a meaningful context (Kovacs 1999; Kaldy and Kovacs 2003). Recent research findings have found out that the frontal lobe developments are not fully mature until the age of 20 to 25 years. This affects their decision making in assessing risk and risk taking behaviours among young drivers, as the frontal lobe governs judgement, decision-making, reasoning, and impulse control (Giedd 2004). In addition to the abovementioned shortcomings of children which make them more vulnerable to injury impact, their developmental stages are also closely related to age, sex, family and social background, school, work and culture. Thus, their exposure to traffic risk factors is also related to the social construct that is affected by where they live, learn, and play.

1.3 The Growing Societal Problem

Roads have always been a dangerous place for children. Child traffic injuries are a global public health problem. Globally, more than 260,000 children die as a result of road traffic crashes each year, and it is estimated that up to 10 million more are injured (WHO 2008). Looking at this problem by age group, death due to road traffic crashes is a leading cause of death for children aged 15–19 years and the second leading cause of death among 5–9 and 10–14 years old (WHO Global Burden of Disease: 2004 update). The WHO report also indicates that in the Western Pacific Region, child transport injuries are one of the top causes of death for children aged 5–14 years old (WHO Global Burden of Disease: 2004 update). In the South East Asia Region, road traffic injuries account for 12% death among children aged less than 14 years old with a mortality rate of 7.4 per 100,000 children.

An Overview of Road Traffic Injuries Among Children in Malaysia and Its Implication on Road Traffic Injury Prevention Strategy

In Malaysia, child road traffic injuries (age 0–19 years old) account for 35.5, 35.3, and 35.2% of total admission to Ministry of Health hospitals due to road crashes in 2003, 2004, and 2005 respectively. They are the top leading cause of hospital admission among children (0–19 years) due to injuries in Malaysia for 2003–2005 (Figure 3). Figure 3 shows that the number of traffic injuries recorded is twice the number of injuries due to a fall among children in Malaysia aged 0–19 years.

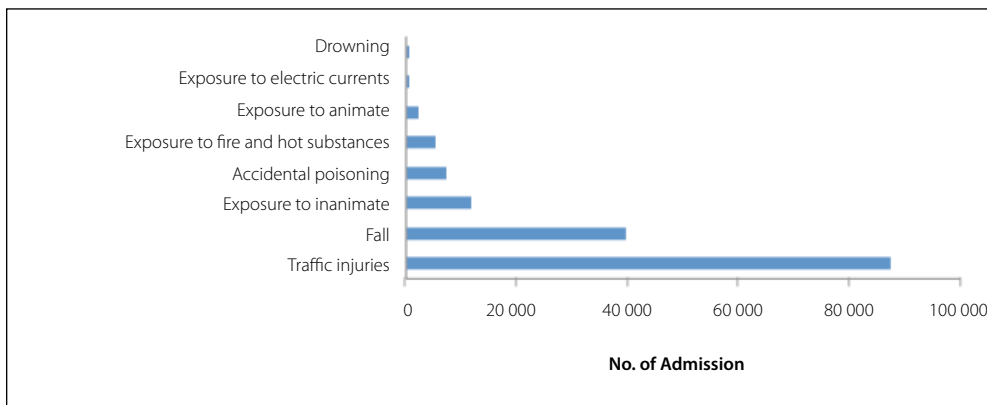


Figure 3 Top leading causes of admission to government hospitals in Malaysia due to unintentional injuries (0–19 years old), 2003–2005 (Source: MOH 2007)

1.4 Consequences of Traffic Injuries on Children

The impact of an injury to a child is more serious than to an adult. Injuries that lead to disability and impairment impede the progress of children in their early years. Children who sustain road traffic injuries frequently require long-term care, depriving them of education and social development opportunities. According to studies on a number of Asian countries, the rate of permanent disability among children aged 0–17 years as a result of road traffic injuries is 20 per 100,000 children. A significant number of children require hospitalisation or miss school as a result of their injuries. In addition, the number of children being hospitalised for 10 days and more as a result of traffic accidents

An Overview of Road Traffic Injuries Among Children in Malaysia and Its Implication on Road Traffic Injury Prevention Strategy

is higher than the number of children being hospitalised due to other types of injuries (Figure 4).

However, the consequences of injuries by severity level and type of injury on children in Malaysia are poorly understood as the number of researches conducted were limited.

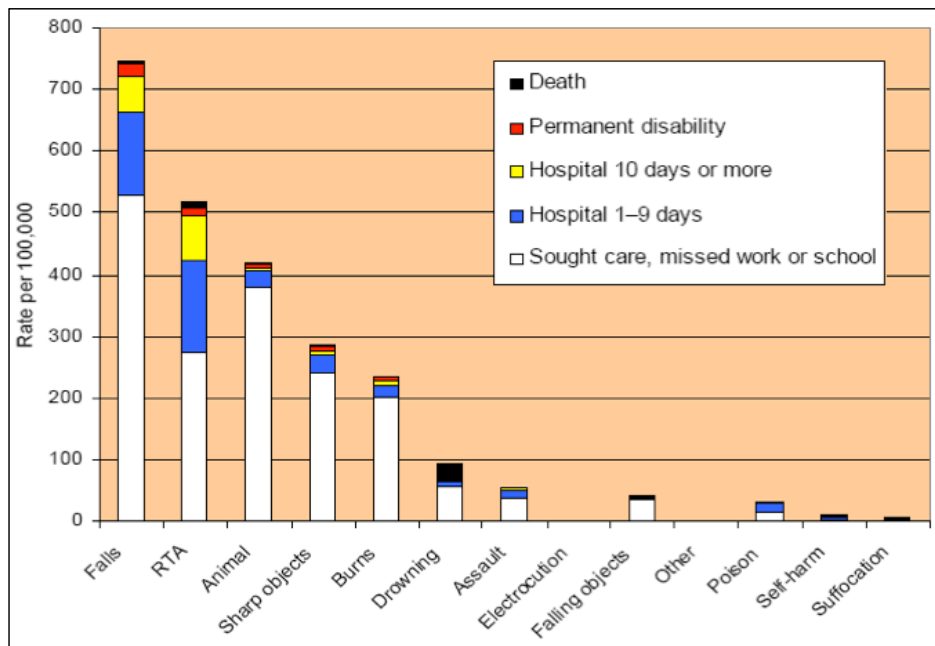


Figure 4 Fatal and non-fatal injury rates by severity for age group 0–17 (Source: Linnan M et. al 2007)

2.0 The Objectives

The purpose of this paper is to identify the burden and patterns of traffic injury among children in Malaysia. It is hoped that this will help identify potential road safety priorities, countermeasures and safety initiatives, that are relevant for use in Malaysia. The specific objectives are as follows;

1. to establish the epidemiology of child traffic injury in Malaysia as reported from the Malaysian Road Accident Database (MROADS);
2. to identify priorities for prevention of child traffic injury in Malaysia; and
3. to provide recommendations for the prevention of child traffic injuries.

3.0 Method and Data Source

Police-based databases are available for analysis from the MROADS database. This report presents the finding within the data period of 2007 to 2009.

The present study has incorporated a number of common variables into the analysis; (i) outcome severity [killed or casualty crash]: death due to road traffic injuries is defined as any death that occurs within 30 days of injury; (ii) types of vehicle involved [motorcycle, pedestrian, bicycle, passenger car, and bus or truck]; and (iii) location of crash.

In addition, no attempt was made to evaluate these differences statistically because of the nature of the available data. Hence, the findings obtained comprise a purely descriptive analysis of differences between the children age group. The analysis, however, is useful as an overview document and helpful in understanding the situation of child traffic injuries, for the purpose of establishing prevention strategies and research agenda in the country.

4.0 Results and Discussion

4.1 10-year Trend in Fatal Child Traffic Injuries in Malaysia

Figure 5 shows the number of road traffic deaths among children aged over 10 years. In general, all age groups show an increasing trend beginning from 2007. The increasing trend is more obvious when shown by the rate of per 100,000 populations of age-specific group (Figure 6). For the age group of 0–4 years old, the increasing trend is alarming, starting from 2.7 per 100,000 populations in 2004 and increasing to 4.2 per 100,000 populations in 2009. This is a 55.5% increase over a five-year period. For children aged 5–9 and 10–14 years old, the fatality rate per 100,000 populations plateaued from 2004 to 2006 and declined trend from 2007 to 2008. However the trend increased again in 2009.

Globally, the road traffic death rate among children is 10.7 per 100,000 populations. There are significant geographic variations in this death rate. In South East Asia, the rate is 7.4 per 100,000 populations, while in Africa it is 19.9 per 100,000 populations. Whereas in high-income-countries, generally the rate varies from 4.2 to 8.2 per 100,000 populations (WHO 2008).

An Overview of Road Traffic Injuries Among Children in Malaysia and Its Implication on Road Traffic Injury Prevention Strategy

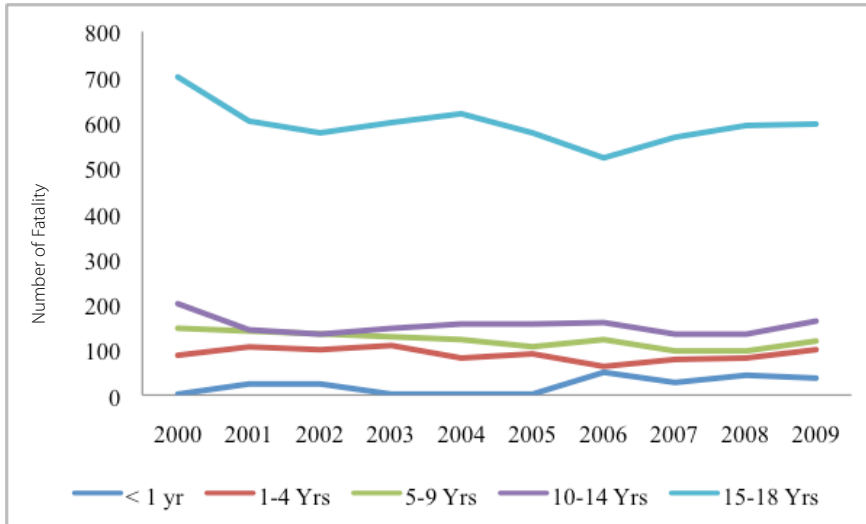


Figure 5 Number of fatalities by age group of children, 2000–2009

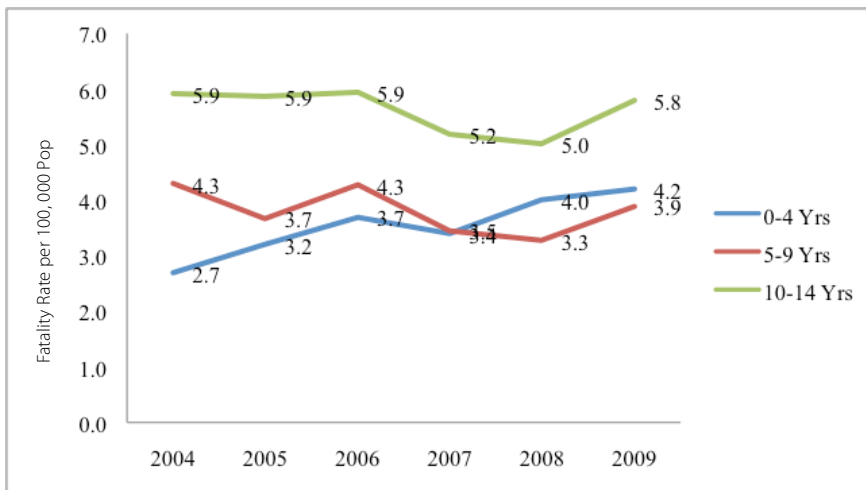


Figure 6 Fatality rate per 100,000 populations of age-specific children, 2004–2009

4.2 Proportion of Child Road Traffic Deaths as Compared to All Deaths Due to Road Traffic Injuries

Child road traffic deaths (age 0 to 18 years old) account for 13.6, 15.1 and 15.5% of the total number of deaths caused by road traffic injuries in 2007, 2008 and 2009 respectively (Figure 7). These percentages are relatively higher as compared to the 12% death by accident among children aged less than 14 years old which is reported to have happened in the South East Asia region.

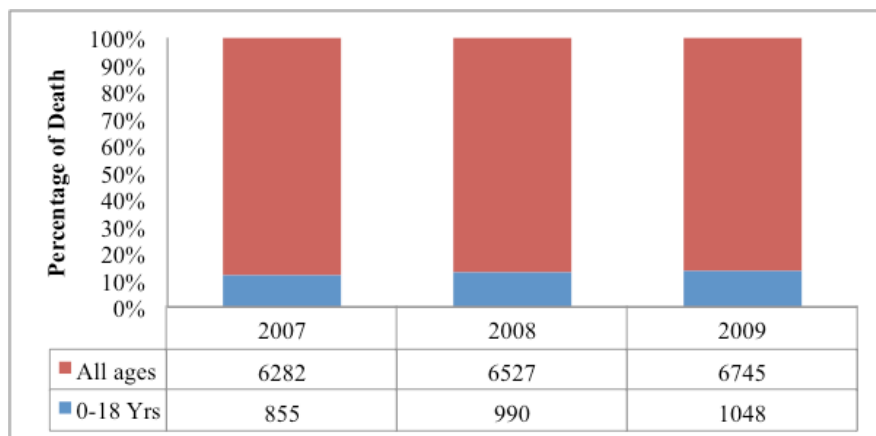


Figure 7 Proportion of road traffic death among children, 2007–2009

4.3 Proportion of Child Road Traffic Injuries by Age Group and Outcomes, 2007–2009

Figure 8 shows the proportion of fatal and non-fatal traffic injury variation by age group in 2007–2009. Children aged 15–18 (57.4%) years old accounted for the highest proportion of death followed by 10–14 (15.2%), 5–9 (10.8%), 1–4 (8.9%), and under one year old (7.5%).

An Overview of Road Traffic Injuries Among Children in Malaysia and Its Implication on Road Traffic Injury Prevention Strategy

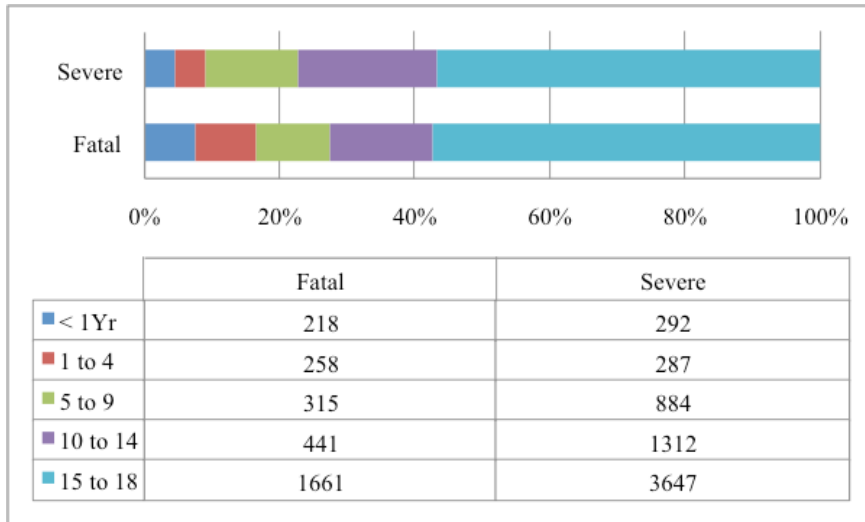


Figure 8 Proportion and number of road traffic injuries by age group and outcomes, 2007–2009

4.4 Proportion of Child Traffic Injuries or Casualty by Gender and Age Group

Road traffic injuries disproportionately affect more male than female. The ratio of male to female as a whole, regardless of age, is 3:1. Among the children age group of 10 years old and below, the difference between gender is not too obvious. However, for age under one year and 10–18 years old, road traffic injuries predominantly affect males (Figure 9). This pattern reflects data from other countries, whereby boys are more likely to be involved in road traffic crashes than girls (WHO 2008).

An Overview of Road Traffic Injuries Among Children in Malaysia and Its Implication on Road Traffic Injury Prevention Strategy

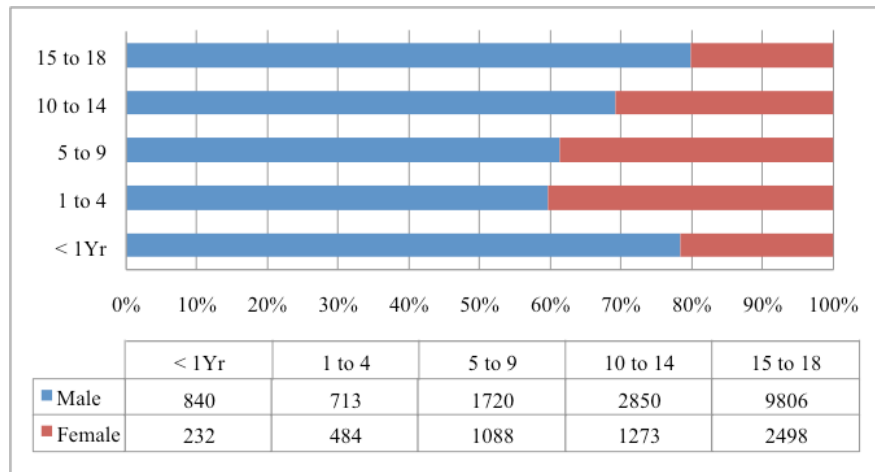


Figure 9 Number and proportion of child casualty due to road traffic injuries by gender-age group, 2007–2009

4.5 Proportion of Child Road Traffic Death by Type of Road User and Age Group

Figure 10 describes the pattern of fatal traffic injury among children by age group. It is obvious that in the early age group (1–4 years) children transported in private vehicles (car, van, 4WD) are the most to die, followed by children transported by motorcycles, and children as pedestrians. The pattern changes with increasing age, among older age group (5–9 years old), children as pedestrians are the most to die followed by children transported in cars, and motorcycles. Children transported by motorcycles are the main cause of death among age group 10–15 years old (shared approximately in equal proportion between children as pillion riders and riders of motorcycles) and 15–18 years old (disproportionately higher proportion of children as riders as compared to pillion riders). Cyclists constitute 2.6% of the total child traffic-related fatalities. Children under one year old were not included here to avoid uncertainty due to the weakness of the database.

An Overview of Road Traffic Injuries Among Children in Malaysia and Its Implication on Road Traffic Injury Prevention Strategy

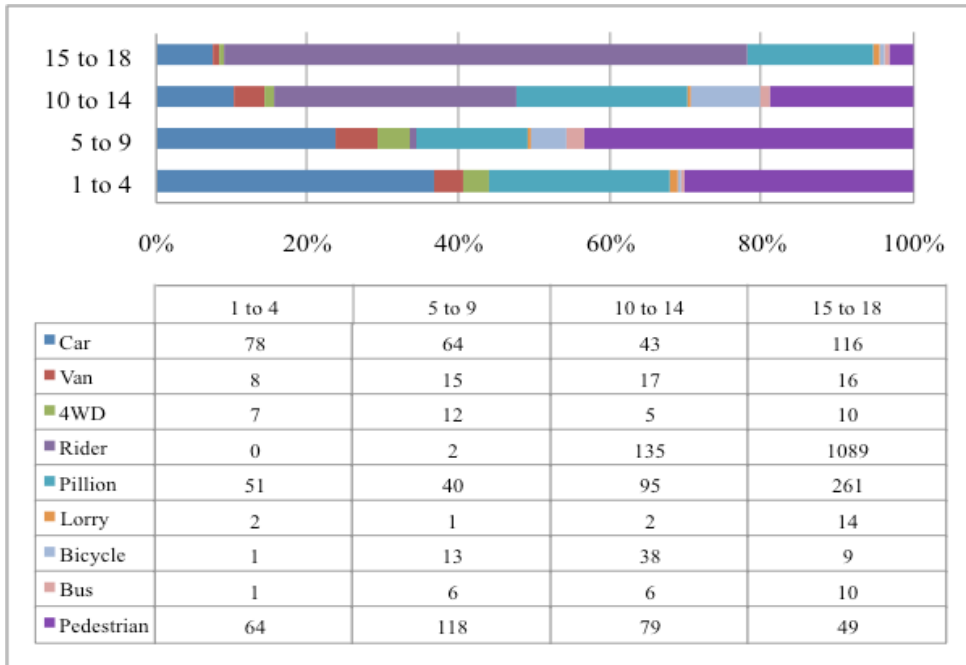


Figure 10 Number and proportion of fatal child traffic injuries by road user and age group, 2007–2009

4.6 Proportion of Casualty Due to Road Traffic Injuries Among Children by Type of Road User and Age Group

Figure 11 shows the proportion and number of casualties due to road traffic crashes among children by age group and type of road user. The pattern of casualty exhibited is approximately similar to the pattern of fatal traffic injuries shown in Figure 10 in item 4.5.

An Overview of Road Traffic Injuries Among Children in Malaysia and Its Implication on Road Traffic Injury Prevention Strategy

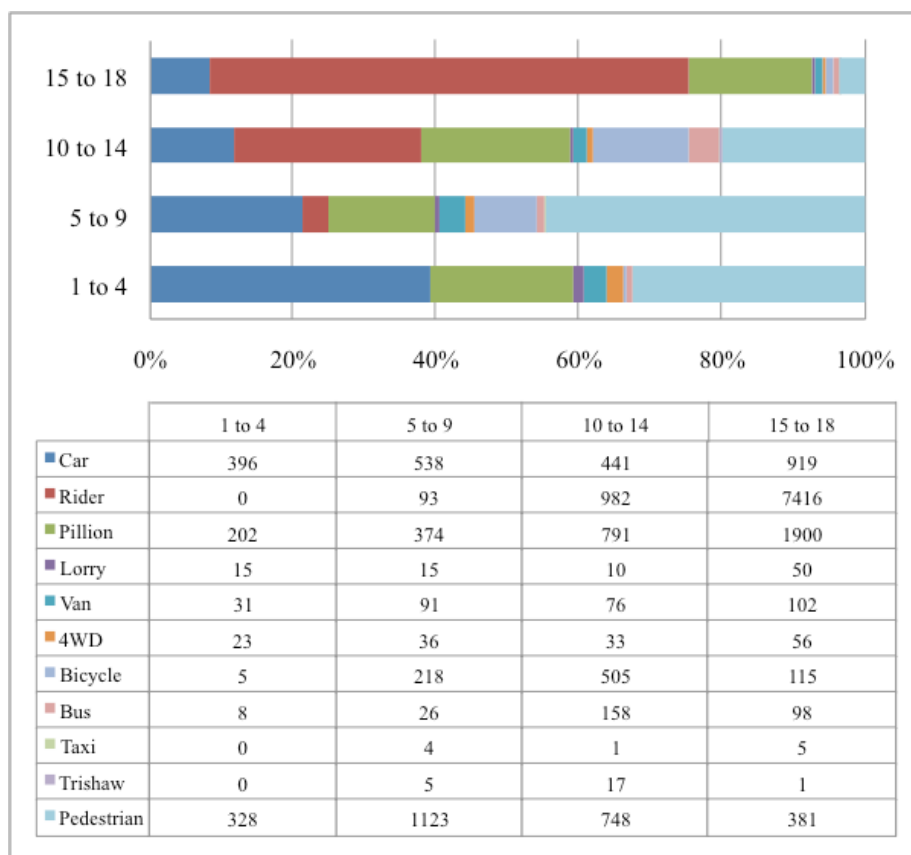


Figure 11 Number and proportion of casualty among children due to road traffic crashes, 2007–2009

4.7 Pedestrian Injuries Among Children in Malaysia

As described in Figures 10 and 11 in items 4.5 and 4.6, pedestrians are the first and the second leading groups of fatalities and injuries among children age 5–9 and 1–4 years old respectively. Therefore, it is important to know the activities that were happening when these pedestrian accidents occurred.

4.7.1 Number and proportion of fatal pedestrian injuries by age group

Figure 12 shows the proportion and number of children pedestrians involved in fatal traffic injuries by age group. The figure shows that 11.6% of children (1–18 years old) suffering from fatal road traffic injuries are pedestrians. This figure is high as compared to 5–10% of children suffering from fatal road traffic injuries in high-income countries. In low-income and middle-income countries, this proportion ranges from 30 to 40% (WHO 2008). The figure is recorded as 11.6% which is just above 10% and not much different from that of high-income countries, which is 5–10%.

By age breakdown, it is obvious that fatal pedestrian injuries vary by age group and affect the younger age group of 15 years old and below, with the highest proportion being among 5–9 years olds. The highest figure is expected to be among the age group 5–9 years old due to the fact that children aged 4–9 years old need adult supervision while walking or crossing the road, as proven in a study conducted by the National Center for Safe Routes to School (NCSRTS) (2011).

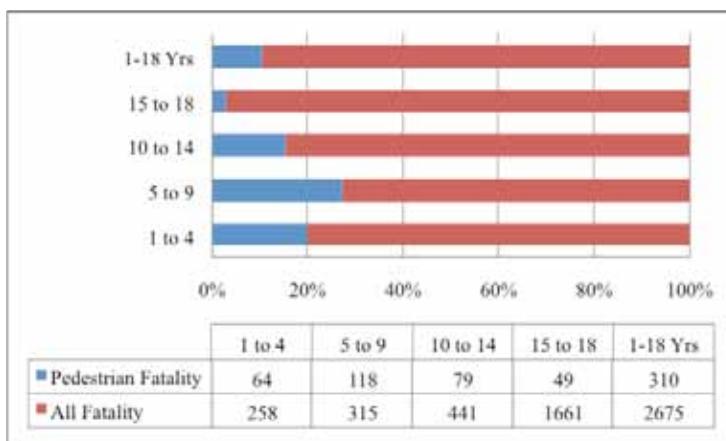


Figure 12 Number and proportion of fatal child pedestrian injuries, 2007–2009

4.7.2 Proportion of children pedestrian injuries by type of activity

Figure 13 presents the type of activity that is happening immediately before a crash happens to a child pedestrian. Road traffic crashes predominantly happen while children are playing/walking on streets or crossing the streets. For children aged 10 years old and below, their late physical and cognitive development process may have contributed to the high risk of road accident. Children in this age group require adult supervision to safely cross the road. According to scientific evidences, children between five and seven years of age exhibit poor ability in recognising and assessing hazards while crossing the road. In addition, their ability to switch attention from one task to another is also poor, leading to an increased risk in getting involved in a crash as they fail to stop or slow down before attempting to cross the road (Dunbar, Hill and Lewis 2001; Siegler and Richard 1979; Zeedyk, Wallace and Spry 2002).

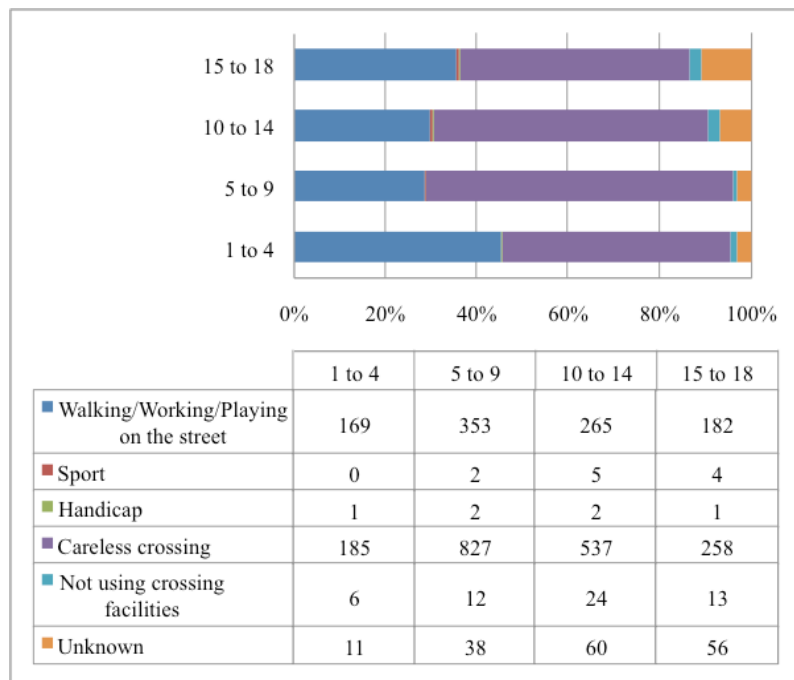


Figure 13 Proportion of child pedestrian injuries by type of activity, 2007–2009

4.7.3 Children’s activities and location of crash

Figure 14 highlights the location where crashes involving child pedestrians occur. In the age group of 1 to 4, it is important to note that crashes mainly occur close to their homes where the kids tend to play by the roadside in residential areas. Injuries also tend to happen close to school areas. These findings are very important for advocacy purposes, especially for parents and teachers.

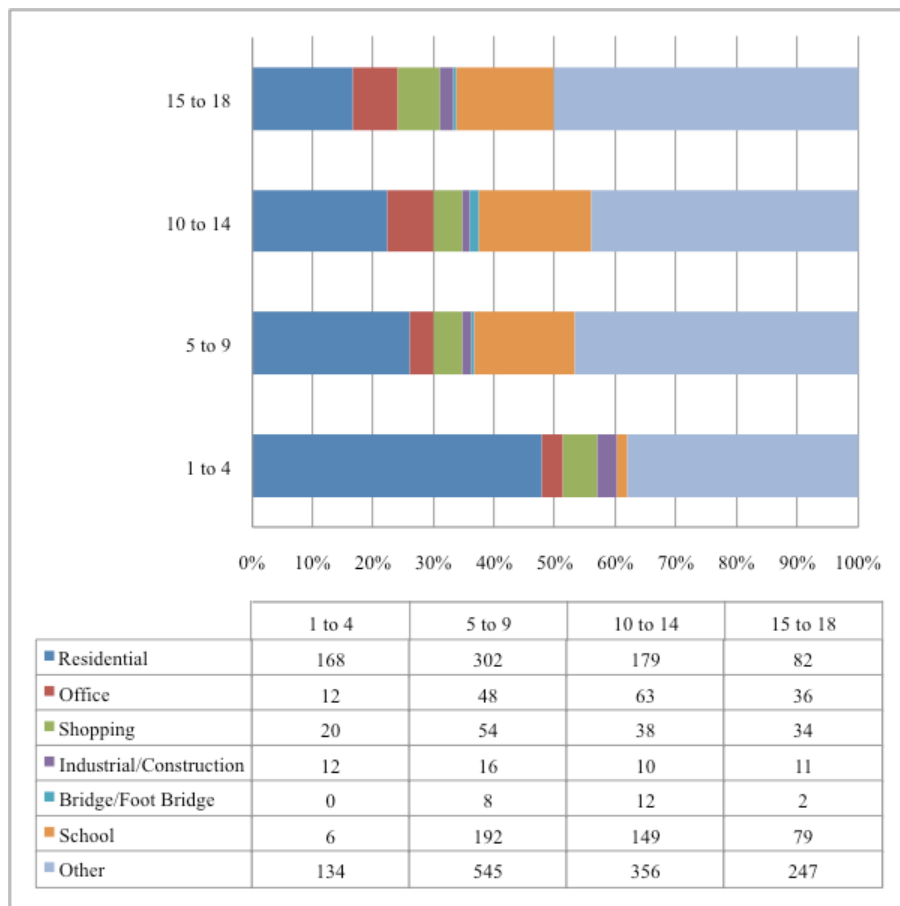


Figure 14 Proportion of child pedestrian injuries by location of road crash, 2007–2009

5.0 Implication on Policy and Programmes

Road traffic injuries are a significant cause of death among children. It accounts for 15.5% of the total fatalities caused by road traffic injuries in Malaysia. They are the leading cause of admission of children into government hospitals due to injuries in Malaysia. Despite the insufficient data, here are the key findings that may have implications on prevention activities.

5.1 Key Findings for Preventive Actions

5.1.1 Children transported in private vehicles (car, van, 4WD) are the first and the second leading groups of casualties among children aged 1–4 years old (43.8%) and 5–9 years old (30.2%) respectively.

This finding highlights the need to implement child restraint systems as a priority for the counter measures in preventing road traffic injuries in this age group. Child restraint systems are effective at preventing fatalities, and are the most important safety measure for children (WHO 2008). In the event of a crash, if restraint systems are properly installed and used, they can;

- reduce deaths among infants by around 70% (Zaza *et. al* 2001; Anund *et. al* 2003);
- reduce deaths among children aged 1–4 years, by 54% (Zaza *et. al* 2001; Anund *et. al* 2003); and
- reduce the chances of sustaining clinical injuries by 59% among children aged 4–7 years who are strapped in booster seats.

5.1.2 Pedestrians are the first and the second leading groups of casualties due to road traffic injuries among children aged 5–9 (43.5%) and 1–4 years (30.2%) old respectively. Among children aged 1–4 years old, 47.7% of crashes involving pedestrian occur close to their homes in residential areas where they tend to play on the streets. The statistics of crashes involving pedestrians near school areas vary by age groups. The highest is among the age group of 10–14 years old (18.5%) followed by children who are 5–9 years old (16.5%) and 15–18 years (16.1%).

Children in these age groups (1–9 years) have poor ability to perceive hazards with their restricted ability in making safe decisions; counter measures that are imposed on them would be very difficult to work effectively. As an alternative, environmental modification and measures on other road users should be given priority. These would include;

- The implementation of safe speed. The speed limit of <30 km/h should be the norm in residential areas. Pedestrians and cyclists are relatively safe only on roads where vehicles travel slower than 30 km/h (Peden *et. al* 2004). Various measures to achieve safe speeds in residential and school areas should be considered. These include but are not limited to traffic calming measures such as speed humps and mini-roundabouts (where appropriate). The implementation of the traffic calming measures should be highly considered during the planning and development of residential roads.
- Signs reminding road users of the speed limit when entering residential areas should also be put in place.

An Overview of Road Traffic Injuries Among Children in Malaysia and Its Implication on Road Traffic Injury Prevention Strategy

- Educational activities that engage the people in residential areas through community-based programmes to make them aware of the situation should be part of the concerted efforts.
- Children tend to use roads as a playing ground if safe spaces for play are not available. Therefore, safe play areas that are easily accessible, adequate in number should be incorporated into residential, school, and urban planning and development.

5.1.3 Children as motorcycle riders are the leading group of casualties among children aged 15–18 years old. Children as pillion riders are the third leading group of casualties for children aged 0–14 years old.

Motorcycles are a common family vehicle in Malaysia, and children may begin to travel on motorcycles at an early age, either by sitting in front or behind the rider. In Malaysia, children are allowed to ride a motorcycle at the early age of 16 years old.

This phenomena as shown in Plate 1 is commonly observed in school and residential areas in Malaysia. These practices should be stopped to prevent road traffic death and injuries among children. The use of a helmet is the single most effective way of preventing head injuries and fatalities that may result from a motorcycle crash (WHO 2007).

To strengthen the activities for motorcycle safety among children, the following measures should be considered.

- Enforcement activities should not only be concentrated on the main roads, they should also be done in areas where children are commonly transported by motorcycles, such as in school and residential areas.

An Overview of Road Traffic Injuries Among Children in Malaysia and Its Implication on Road Traffic Injury Prevention Strategy

- Educational activities that engage the people in residential areas through community-based programmes to make people aware of the situation should be part of the concerted efforts.
- Governments at national levels should consider or encourage policies for provision of two helmets along with sale of motorcycles (including the possibility of helmets for children).
- Awareness programmes should give special attention to issues regarding dangers of transporting children younger than five years old on motorcycles.



Plate 1 Overloading and un-helmeted children being transported by motorcycles

5.1.4 Apart from the specific measures targeted at children, general measures for road safety should also be implemented to prevent road traffic injuries among children; as shown in Table 1.

An Overview of Road Traffic Injuries Among Children in Malaysia and Its Implication on Road Traffic Injury Prevention Strategy

Table 1 Matrix of effectiveness of each road safety strategy

Strategy	Effective	Insufficient evidence	Ineffective	Harmful
Utilising appropriate child restraint and seatbelt	Effective			
Use of motorcycle and cycle helmet	Effective			
Speed reduction around school, residential, play areas	Effective			
Enforcing daytime use of headlight for motorcycles	Effective			
Separating different types of road user	Effective			
Enforcing DUI	Effective			
Increasing the visibility of pedestrians		Insufficient evidence		
Introducing the dangers of drink-driving from school		Insufficient evidence		
Conducting school-based driver education			Ineffective	
Seating babies or children on a seat with an air bag				Harmful
Licensing novice teenage drivers				Harmful

(Source: WHO 2004 and Dellinger *et. al* 2007)

5.2 Key Findings for Future Research

5.2.1 The ratio of road traffic death to road traffic injuries is very small, one death to 2.2 severe injuries. This indicates the incompleteness of police-based data in representing the injury cases. This could be due to a few reasons, such as the fact that not all road traffic injury cases are reported to the police, especially when the victims sustain only mild injuries. Despite offering better information for describing injury severity, a hospital-based research could offer a better coverage of more severe injury cases. However, a hospital-based research is still inadequate in addressing the whole of the public health burden that goes unreported to any hospital and police department. These groups of children are those who sustain mild injury and seek medical treatment at various outpatient clinics, either at government or private health care facilities. Many of them purchase the required medicine over the counter and miss school because of the injuries.

5.2.2 The consequences of road traffic injuries on children in Malaysia are poorly understood. The actual public health burden due to road traffic injuries, permanent disability, hospitalisation, and missed school day among children are not known. In order to identify these burdens, studies that are similar to any that has been conducted by UNICEF in a number of Asian countries can be conducted in our setting.

This effort is important as it can better define the **child-injury pyramid** in this country.

5.2.3 The MIROS Road Accident Analysis and Database System (MROADS) is unable to correctly 'code' children who are below one year old of age. This could be due to a human error while entering the data. Many cases with "unknown" age were coded as "0", the same coding as children who are below one year old of age. These issues need to be addressed and communicated to police officers.

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